AU/ACSC/0602B/97-03

BARRIERS TO AMERICAN MILITARY AVIATION TECHNOLOGY PRIOR TO WORLD WAR ONE

A Research Paper

Presented To

The Research Department

Air Command and Staff College

In Partial Fulfillment of the Graduation Requirements of ACSC

by

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March 1997

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Contents

Preface

Interest in America's first full-fledged air war, World War One, has led me to countless documents expounding on the early history of aviation. Many of these works relate the early use of balloons, both in the United States and abroad, and all of them discuss the exploits of the Wright brothers and developments in heavier-than-air flight. The thing that stands out in each of these histories is the glaring lack of a US contribution to military aviation development prior to the war. With Americans such as Chanute, Langley and the Wright brothers pioneering powered flight, why did the United States seemingly "drop the ball" in the years preceding our entry into the World War One? The answer to that question is what drove me to write this paper.

Abstract

The purpose of this research is to determine what barriers stood in the way of US military aviation technology in the years preceding its entry into World War One, and how they dealt with these barriers. In addition, we will take a brief glimpse at how similar barriers could affect the future of US military aviation as we move into the post Cold War world.

The main reason for investigating this topic is to provide a single document setting forth some of the pitfalls, barriers, and attitudes that caused the United States to miss out on advances in aviation aerial technology prior to World War One. By discussing trials and errors we will shed light on the implications of this struggle with respect to current Air Force air and space development. This paper could not attempt to deal with every pre-war barrier to the development of military aviation in the United States, nor could it attempt to cover in totality those barriers mentioned. Instead, this study will provide a basic knowledge of the problems and discuss their implications.

In presenting the problems encountered by proponents of US heavier-than-air technology we will begin by showing how American military aviation developed prior to the twentieth century, demonstrating how the United States led the world in powered flight. We will then describe the barriers to powered flight, showing what, if anything, happened to overcome these barriers. Finally, we will conclude by moving from US entry into World War One to the present, giving a brief synopsis on lessons learned and how the

US can avoid and overcome obstacles as it seeks to dominate air and space technology in the future.

Chapter 1

Early American Balloon and Dirigible Aviation

Following the first hot-air balloon flights by the Montgolfier brothers in 1782, the first aerial feat inside the United States to attract attention was when 13 year old Edward Warren became the first American to fly in a hot air balloon on June 24, 1784.[1] Later, Jean-Pierre Blanchard became the first person to achieve untethered flight in the United States on January 9, 1793.[2] Over the next 80 years modifications, especially in the area of maneuverability, were attempted without much success. When the US Civil War began in 1861, neither America nor the rest of the world had progressed far from the first conventional balloon designs.

The Union Army opened US military aviation in July 1861 when it issued a contract to John Wise to construct two observation balloons. Unfortunately, Mr. Wise and his balloon failed to show for their first battle and the Army canceled the ill-fated venture.[3] At around the same time, Thaddeus Lowe was experimenting with balloons and his work caught the imagination of President Lincoln. As a result, the Union Army took Lowe under contract to develop a balloon corps. His balloons were used mainly as stationary observation platforms, but there was also some experimentation with untethered flight, use of a coal barge as a mobile base, gas burning searchlights to aid night ascents, and tying into telegraph wires for sending messages air to ground.[4] Unfortunately, they lost all of

their balloons in a retreat from Richmond early in the war. Apparently, due to the awkwardness, limited utility, and lack of creativity by its practitioners, the Army wasn't satisfied with the balloon and didn't see reviving it as worth the effort. Later, in May 1863, Lowe resigned as head of the balloon corps, and the whole concept was scrapped.[5] During its existence, the Union Army Balloon Corps was only paid lip-service, and this only to pacify the President's interest. Lack of supplies, money, and leadership caused for low morale in the corps. In addition, no branch of the military wanted responsibility for the balloon and it was transferred from one unit to another, never gaining a permanent home. All told, the Union Army never owned more than 7 balloons at any one time, and the concept never captured the imagination of the military.[6] In contrast, the exploits of balloons during the war had a powerful impression on Captain F. Beaumont, a British officer attached as an observer to the Union Army. Finally, with the aid of a wealthy fellow officer, he was able to get the British War Office interested in balloons as weapons of war.[7]

According to Captain A. Hildebrandt, a Prussian Balloon Corps officer, the balloon and military aviation disappeared from the United States for about thirty years following the civil war.[8] In the meantime, European Armies were regularly employing balloons in both experimental and practical roles; almost every country in Europe developed balloons over the next several decades, and virtually all of the European powers had a Balloon Corps by the 1880's.[9]

Balloons were an integral part of European military's during the late 1800's, and were used in most major actions and exercises both at home and abroad. The balloon was successfully employed not only as a ground observation platform, but it was also tethered

to ships or barges for use in submarine spotting and shore reconnaissance.[10] During the Franco Prussian War, both sides used hydrogen balloons and the French found the balloon to be crucial in getting messages out of Paris during the siege in 1870.[11] Even with a full moon, the balloon was all but invisible at night and dozens were employed to carry messengers outside the city. Hildebrandt attributes this feat, and the aid which it brought the French, as being the primary reason they did not surrender earlier. It was not until 1892 that the balloon reappeared in US military aviation.[12]

In 1898, Major Joseph Maxfield, US Army Signal Corps, led a hydrogen balloon company during the Spanish-American War and they were successful in determining the location of forts and ships in and around Cuba.[13] Unfortunately, the feat most remembered by historians is the fact that the balloon was eventually shot down by the Spanish. Maxfield apparently failed to learn a lesson that the Europeans already knew: the balloonist must not only perform tactical reconnaissance, he must also look to see that his position is not compromised. Another criticism was that the balloon drew unwanted attention to the American lines.[14] Once again, the United States dropped the balloon from its inventory.

In contrast, the airship was gaining some notoriety at the turn of the century as a means of steerable flight superior to the balloon, but US involvement, especially on the military side, was minimal. In 1904, US Army Captain Thomas Baldwin built a dirigible with a lightweight gas engine that was superior to any other model at the time. The Army contracted to purchase one stipulating that it must stay aloft for 2 hours and attain a minimum speed of 20 knots. When tested, it did stay up for two hours but it only reached

a speed of 19 knots. As a result, the Army purchased the aircraft but penalized Baldwin 15 percent on the contract price for failing to attain 20 knots.[15]

Airships were not commercially manufactured in the United States until 1911, and the United States military did not purchase another dirigible until 1917.[16] Several problems hampered the evolution of dirigibles. First, for many years the airship depended on highly flammable hydrogen, not suited for military use. Helium was a suitable substitute but it was hard to manufacture in any quantity.[17] Second, although most dirigible accidents were due to operator error, the large number of crashes, many with spectators present, brought bad publicity. Karl, Wolfert, a German inventor, died in 1897 when his powered dirigible caught fire at 3,000 feet during its first military demonstration. This disaster put airships out of favor for many years.[18] In 1902, a French-domiciled Brazilian balloonist named Augusto Severo died along with his mechanic when his balloon burst. That same year, a dirigible made to German Government specifications crashed killing both men on board when the gondola cables became twisted in flight.[19] The final development which hampered the development of airships was the invention and subsequent development of the airplane. Although airship development continued well into the twentieth century, and balloons and dirigibles saw extensive use in World War One, the airplane eventually won out as the primary competitor in military aviation.

As shown above, there were several obstacles that prevented the balloon and dirigible from gaining a foothold in United States military operations. Unlike other developed countries, the United States never devoted the resources necessary to master their use. Of the six years I researched between 1890 and 1899, no more than $18,000 of an approximately $52 million dollar annual Army budget was ever spent on the Signal Corps;

that includes their entire budget.[20] I could not locate an itemization for balloon expenditures, but it stands to reason it was far less than $18,000. Even with the problems encountered, the countries of Europe, especially Germany and France, continued to press on and develop credible and useful airship technology. Between 1899 and 1914, the French built thirty-nine airships. During the same period, Germany built twenty-eight.[21]

Apart from the obstacles already mentioned, the most probable reason that the United States didn't pursue airships at a greater pace was the lack of apparent necessity. One of the main factors which spurred Germany to build airships was their belief that they would be useful in war against the historic enemies that surrounded them.[22] Likewise, Italy and England saw the advantages of being able to fly over the enemy. On the other hand, the United States felt relatively safe from foreign invasion; a real attack would have to come by sea. Hence, they were more interested in developing a Navy to protect their shores. Although the Navy developed some small non-rigid airships, the United States never really became interested in airpower until Zeppelins bombed London during World War One.[23]

Notes

[1]Ferry, James Douglas G., *Da Vinci To Douglas: An Historical Development Of Airlift*, (Air University Research Study, 1975), 8.

[2]Ibid., 9.

[3]Ibid., 14.

[4] Collier, Basil, *A History of Air Power*, (New York, Macmillan Publishing Co., 1974), 11.

[5]Ferry, 15.

[6]Ibid.

[7]Collier, 12.

[8]Hildebrandt, A., *Airships Past and Present*, (London, Archibald Constable & CO., 1908), 169.

[9]Collier, 13.

Notes

[10]Hildebrandt, 151-174.

[11]Ferry, 13.

[12]Hildebrandt, 151.

[13]Ibid., 169.

[14]Chandler, Charles D., *How Our Army Grew Wings*, (New York, The Ronald Press Company, 1943), 45.

[15]Ferry, 26-27.

[16]Collier, Basil, *The Airship*, (New York, G.P. Putnam's Sons, 1974), 51.

[17]Ibid., 9.

[18]Ibid., 36.

[19]Ibid., 35-40.

[20]Report of the Secretary of War, (*Annual Reports of the War Department*, 1890-1897), et al.

[21]Hildreth, C.H., *1001 Questions Answered About Aviation History*, (New York, Dodd, Mead & Company, 1969), 31.

[22]Collier, 19.

[23]Ibid.

Chapter 2

The Birth Of The Airplane

Heavier-than-air aviation was first demonstrated to be viable by Professor Samuel Pierport Langley, a professor of physics and former Secretary of the Smithsonian Institution. Initially, he designed a 16-foot model monoplane powered by a 2 horsepower steam engine. In May 1896, his model was catapulted off of a houseboat on the Potomac river. It attained a speed of 25 miles per hour and reached an altitude of 3,200 feet before landing in the water. Later in the year he repeated the feat.[1] The United States Government seized upon his idea and in 1896 he was awarded a contract to build a full sized man-carrying version of his plane.[2]

Prior to gaining the military contract, Langley had considered his experiments in aviation complete. It had taken him 18 years of hard work to get his model off the ground and now, at the age of 64, he found himself with an even bigger obstacle: finding an engine that would get a man aloft.[3] Knowing his model gas engine wasn't strong enough for his full-scale airplane (which he called an "aerodrome"), Langley first tried to find a source in the United States. He was able to procure a contract for a 12 horsepower internal combustion engine with S.M. Balzer Company of New York but later came to the conclusion that he needed at least twice that power to get airborne. In 1900, he went to Europe to see if he could find an engine that was sufficiently powerful yet light enough to

meet his needs. When he approached French designers they thought his ideal of a light-weight engine near to impossible: "Do you know what you're asking?" the designers said. "You want a gasoline engine that weighs less than ten pounds per horsepower. You're asking the impossible. Besides, if such an engine is feasible, we would build it for our own country, not for the United States!"[4]

Although he was unable to procure the engine he needed overseas, Langley did return with a few new ideas. Consequently, he went back to the Balzer Company and, together with his engineer Charles M. Manly, was able to build on Balzer's design. By December 1902 they had developed a 52.4 horsepower engine that weighed in at 187 pounds, including tanks, batteries, and accessories.[5] The development of a suitable engine wasn't the end of Langley's pre-flight endeavors. He had to build his full scale *aerodrome* and work out the bugs, along with devising a new houseboat and launching mechanism.[6]

Finally, after four years and over $70,000 of expense ($50,000 from the War Department and $20,000 from the Smithsonian), Langley was ready to test his creation. Due to his small size, Charles Manly was chosen to pilot the *aerodrome*. On October 7, 1903, three months after it was initially scheduled to fly, Manly made his first attempt from the houseboat. Unfortunately, the aircraft got too vertical on takeoff, causing it to fall backwards into the Potomac immediately after launch. Langley and Manly felt certain their *aerodrome* was running well and they blamed the crash on a snag in the launching system. News of this setback dealt a critical blow to manned flight. The large number of newspaper reporters who had spent weeks in the malarial infested countryside of the District of Columbia, covering the epic flight, burst into spontaneous sarcasm and ridicule regarding Langley's failure ("Langley's Folly"). As a result, many lost interest with the

idea of manned heavier-than-air flight.[7] Undeterred, on December 8 Langley dared a second attempt. With gusting winds, the weather wasn't perfect, but "there was no more money" and, with the Spanish-American War long past, interest in the machine was wavering. Again, this second launch attempt failed. The crash was blamed again on the launching mechanism but with money expended, ridicule from the press, and discouragement from the War Department the venture was canceled.[89] The editorial ridicule was so great that the War Department, conscious of the need for appropriations from a Congress that wasn't optimistic about the airplane, came to distrust all inventors of heavier-than-air technology.[10]

Another great American aviation pioneer was Octave Chanute (1832-1910), recognized as "the foremost authority" on aviation of his time, and the man who proved the feasibility of heavier-than-air flight.[11] His work with Lilienthal type gliders and the invention of the biplane gave the Wright brothers the basis and encouragement to develop and fly the first manned airplane. Later in life, Chanute was instrumental in tracking the progress of aviation worldwide, wading through a multitude of material leading to his book entitled, *Progress In Flying Machines*, published in 1899. This book compiled all of the important data on aeronautical design up to the time, and his innovations in aerodynamics were used for many years by other aircraft designers.[12] I find no evidence to support the notion that Chanute had any personal contact with Professor Langley in his development of the *aerodrome*. Nevertheless, Chanute's work was renowned when Langley made his manned-flight attempts, and I speculate that Langley, like most other students of aeronautics, was familiar with his work.

Nine days after Langley's last attempt, Wilbur and Orville Wright made the first manned heavier-than-air flight. They made a total of four flights that day, the longest of which covered 852 feet and lasted 59 seconds.[13] The Wright brothers venture into flying was not a spur of the moment event. Their earliest work in transportation was with bicycles, but they were intrigued with flight at an early stage. The initial basis of their knowledge came from extensive reading of every available source on aerodynamics, including Chanute's book, a work by L.P. Mouillard written in 1881, and pamphlets by Langley.[14] In fact, Chanute was present during much of the Wright's aerial experimentation.[15]

The Wright brother's earliest work in aviation was with kites. Later they started to experiment with biplane-like gliders. In 1901 they set new glider records but they were still not satisfied that their design would translate into a powered and controllable aircraft.[16] One of their biggest obstacles was the lack of constant wind velocities. As a result, they were the first to design and use a wind tunnel to test their designs. They also relocated their experiment to the outer banks of North Carolina to take advantage of wind conditions. Use of the wind tunnel enabled them to develop a glider that successfully flew 1,000 times in 1902.[17] After these successful flights they turned their attention to acquiring a light-weight engine to power their glider. Like Langley, they initially turned to outside sources to design an engine. At the time, several American companies were experimenting with automobile engines, but they could not find a suitable design for their purposes. Again like Langley, they turned to their own machinist, Charles E. Taylor, who developed an engine that would produce up to 12 horsepower. They also designed their

own propeller system, utilizing two propellers rotating counter clockwise to each other. The result of their effort was the birth of powered, manned flight.

In comparison, many aspects of the Wright brother's and Langley's aircraft stand out. From a mere technical standpoint, both saw the need for two main sets of wings. However, due to their wind tunnel and use of prevailing winds at Kitty Hawk the Wright brother's were able to do more thorough testing of their design. By the time they flew a manned flight they knew that their design would work in-scale. Similarly, both used a ramp to gain speed for their takeoff, the main difference being that instead of a dual track sled, the Wright brothers had the foresight to use a monorail device with a counterweight system, essentially halving the chance of a malfunction or snag on takeoff. Langley blamed both of his manned crashes on his launching device, whereas, the Wright's had the technology to overcome this problem. Another aspect that stands out in the reading is the superior air worthiness of the Wright *Flyer* over the *aerodrome*. (In 1914, Langley's original *aerodrome* was flown by Glenn Curtiss, but not before several structural modifications had been made.)[18] Just by looking at the two aircraft it is easy to see that the Wright's had a more sturdy airframe. The wings of the *aerodrome*, suspended from steel rods protruding from the framework, stood in contrast to the Wright brothers use of lightweight tubing for mutual wing support. The Wright design appears to keep intact the relative lifting surface of each wing, negating some of the effects of airfoil distortion caused by induced friction and other forms of drag. In addition, the Wright brother's determined that they only needed 8 horsepower to get airborne.[19] As a result, their engine (eventually producing 14 horsepower) weighed less than Langley's, allowing them to use more structure to support lifting surfaces as opposed to supporting an engine.

Furthermore, the empty weight of the *Flyer* was 605 pounds, compared to the 730 pound weight of the *aerodrome.*[20]

As shown on the preceding pages, Americans were indeed the first to envision, develop, and eventually fly heavier-than-air, manned aircraft. Furthermore, the vast majority of this research and development was done without input from other countries. This being the case, why then didn't the United States lead the world in developing this technology over the next two decades? Specifically, what hindered the development of the aircraft by the one country best poised to see it come to fruition, the United States? In the next chapter we will discuss these questions.

Notes

[1]Ferry, James Douglas G., *Da Vinci To Douglas: An Historical Development Of Airlift*, (Air University Research Study, 1975), 43.

[2]Sweetser, A., *The American Air Service*, (New York, D. Appleton, 1919), 5.

[3]Vaeth, J. Gordon, *Langley, Man Of Science And Flight*, (New York, The Ronald Press Company, 1966), 67.

[4]Ibid., 73.

[5]Ibid., 74.

[6]Ibid., 73-92.

[7]Sweetser, 5.

[8]Vaeth, 81-90.

[9]Sweetser, 6.

[10]Holley, I.B., Jr., *The United States Air Force Special Studies, Ideas and Weapons,* (Washington, D.C.: Office of Air Force History, 1983), 26.

[11]Chanute, Octave, "Recent Progress In Aviation," (*Annual Report Smithsonian Institution*, 1910), 145.

[12]Hildreth, C.H., *1001 Questions Answered About Aviation History*, (New York: Dodd, Mead & Company, 1969), 45.

[13]Chandler, Charles D., *How Our Army Grew Wings*, (New York, The Ronald Press Company, 1943), 135.

[14]Hildreth, 46.

[15]Chanute, 146.

[16]Hildreth, 47.

[17]Ibid.

Notes

[18]Vaeth, 110.
[19]Chandler, 132.
[20]Ibid., 96, 133.

Chapter 3

Barriers To Early American Military Aviation

Initially, press coverage of the success of the *Flyer* was very limited, and often inaccurate. One account in British newspapers said the aircraft had flown 3 miles and landed at a predetermined spot.[1] Because this seemed an outlandish claim at the time, many refused to believe that the aircraft had flown at all. Rumors abounded, but few people were aware of the facts and even fewer knew the implications of manned flight.[2] Consequently, there were not many people knocking at the Wright's door, seeking orders for their machine.

A European, Lieutenant Colonel J. E. Capper was one of the first people to see merit in the Wright brother's invention. As commandant of the Royal Engineers' balloon school he traveled to the United States in early 1904 to attend an exhibition, taking the opportunity to pay a visit to the Wright brothers in Dayton.[3] His interest in the program, and the military's interest in Langley's experiments convinced the Wrights that their invention was valuable. Whether out of patriotism or pragmatism, they first attempted to sell their aircraft to the US government. Unfortunately, the failure of Langley's *aerodrome*, the first aircraft paid for by public funds, discouraged the United States from offering the Wrights a contract.[4] Failing in America, the Wrights sought to sell their airplane to the British.

Though interested, the British didn't think the Wright's aircraft was well suited for military use. For starters, the pilot had to lay prone in the aircraft, making him susceptible to ground fire. Furthermore, the pilot had to devote all of his time to controlling the airplane, rendering him useless to carry out military duties such as observation or aerial bombardment. Nevertheless, Capper continued to press for purchase of the aircraft. Unfortunately, the Wrights, fearing their secrets might be stolen, refused to let the British fully inspect their *Flyer* prior to purchase.[5] The Wrights made numerous overtures to the United States and British governments over the next few years, to no avail. Consequently, fear of further failure from the United States Government, lack of cooperation with the British, and the lack of foresight from both countries kept the Wright brother's invention on the shelf.[6] Disappointed by their inability to sell their aircraft, along with a nagging fear that someone may steal their invention, the Wright brothers ceased flight operations for almost three years, starting in October of 1905.[7]

United States distaste for aviation as a weapon of war was revealed early, at the Hague Conference of 1899 when the U.S. State Department sponsored a five year prohibition against using the balloon for offensive purposes. At the Second Hague Conference in 1907, only the United States and England were willing to extend this moratorium; England eventually abandoned this position and joined the other European powers in exploiting the aerial weapon.[8]

Additional evidence that the United States military establishment shared the State Department's disinterest in aviation at the turn of the century can be gleaned from the pages of the *Annual Reports of the War Department.* Although the balloon was mentioned along with a $10,000 expenditure on page fifty of the 1897 report, no mention

of the two appropriations of $25,000 each for Langley's research can be found in any of the Annual Reports. In the 1904 edition, Secretary of War William Howard Taft singled out the Signal Corps for "foresight and energy" in executing its projects for the year, but never mentioned aviation.[9] This wouldn't seem strange except for the fact he singled them out, yet failed to mention aviation even though the Wright brothers were already flying their *Flyer* on a regular basis. Not until 1908 does the *Annual Reports of the War Department* mention aviation, and that report is flawed: the report states that a Frenchman named Farman made the first heavier-than-air flight, and mentions his recent 1 mile flight.[10] In reality, Henri´ Farman flew for Gabriel Voisin and they only made powered glider flights in 1903; they were unable to sustain themselves in level flight until 1907.[1112] Furthermore, the Wright brothers were regularly making trips in excess of 1 mile as early as 1905, and had demonstrated flights much longer than that to both the US Army and Europe in late 1908.

Although the Wright's epic flight seemingly spurred little interest in America, the same cannot be said for the rest of the world. In France, news of their early success with gliders made a powerful impact on students of aeronautics. French Captain Ferdinand Ferber, along with the Aero Club de France, was inspired by the writings of Chanute (on the Wright's glider experience) to develop a series of semi-successful powered-glider flights. In fact, Ferber corresponded with Chanute and eventually abandoned the Lilienthal-type craft in favor of the Chanute-Wright design.[13] Robert Esnault-Pelterie, a French engineer, copied the same design and invented the aileron system as a replacement for wing-warping.[14] French efforts eventually culminated in the first powered airplane

flight outside the United States: on October 23,1906, Alberto Santos-Dumont flew his box-kite-like design 164 feet at a speed of 25 miles per hour.[15]

Eventually, the mystery surrounding the early success of the Wright brothers dissipated. News of their demonstration flights, both prior to 1906 and after 1908, convinced many; inventors, dreamers, and engineers from around the world eventually sought and obtained Chanute-Wright and French designs. For example, developers in Austria, Germany, England, Italy, and Russia worked on gliders and powered flight. Many of these people, though inspired by the writings of Chanute and the success of the Wright brothers, worked in isolation from their contemporaries: Enrico Forlanini, an Italian engineer, experimented with rocket propulsion and eventually flew an Italian-made plane in 1910. Igor Sikorsky of Russia experimented with helicopters and designed an airplane that flew in 1910. It wasn't until 1930, and then in the United States, that he developed a workable helicopter.[16] Because of their success with dirigibles, Germany had become somewhat complacent about developing an airplane. Nevertheless, Hans Grade built a wing-warping plane that flew in 1908.[17]

In 1907, attempts by the Wright's to sell their aircraft to the United States Government again fell on seemingly deaf ears. The Board of Ordnance and Fortification replied in no uncertain terms that there was no money available to risk on aviation. Nevertheless, on December 23, 1907, the War Department reconsidered the use of the airplane for military purposes, and issued specifications for an acceptable military aircraft. At the time, the requirements were extremely demanding. The military wanted the aircraft to reach a minimum of 40 miles per hour, fly for an hour with two people on board weighing a total 350 pounds, have a fuel capacity that would enable it to cover 125 miles,

and be steerable in all directions without difficulty.[18] Twenty-four bids were received, but only two contracts were awarded, one of those to the Wright brothers in February 1908. The other bidder, A.M. Herring, was unable to get his aircraft ready for testing.[19]

Unfortunately, a stingy and short-sighted Congress refused the War Department's request to fund the Wright brother's project. Luckily, the Wright brothers had entered earlier agreements with European firms from which came their capital.[2021] During the first half of 1908, the Wrights developed an improved version of their *Flyer III*. This version provided seats for both a pilot and passenger and had a 30 horsepower engine. Again, it required a ramp for takeoff.[22] On September 9, at Fort Myer Virginia, Orville Wright flew his first demonstration sortie, circling the ground fifty-seven times at an altitude of 100 feet, demonstrating to the military that his aircraft was functional. Over the course of the next few days he repeatedly demonstrated that the *Flyer III* could fly safely, and be controlled easily. On 17 September, in a catastrophic reverse of fortune, the aircraft propeller broke at a height of 75 feet with Orville and Army Lieutenant Thomas Selfridge on board. The crash that followed killed Selfridge and badly injured Orville. This first Army aircraft death put an end to the flying program for the year and the plane was demolished. Fortunately, the Army didn't cancel the contract, and requested a new plane be delivered by June 1909.[23]

At about the same time, Wilbur was demonstrating an identical *Flyer* successfully in France, making more than 100 flights from August 8 to December 31, 1908, and the airplane was more readily received in France than in the US.[24] A member of the Aero Club de France claimed that the invention "controlled the fate of the nations," and Wilbur won a 20,000 franc prize for staying airborne for 180 minutes while covering 80 miles.[25]

Throughout the world the desire to develop powered flight brought about many competitions and awards for aerial feats. Apart from the French award mentioned above, other monetary awards were offered in France and elsewhere. For instance, Earnest Archdeacon of France offered up to 50,000 francs for developments in powered flight.[26] Hans Grade of Germany won $10,000 from his country for being the first German to develop and fly an airplane. English newspapers offered a 10,000 pound prize for a flight of 185 miles, and 1,000 pounds for a flight across the Channel.[27] Although there were some competitions in the United States, sponsored by publishers and philanthropists, they paled in comparison to the number of competitions and prize money offered abroad.

The Wright's resumed military trials at Fort Myer in the summer of 1909 with a new plane that exceeded the government's expectations. Finally, five years after the first successful flight the United States Military had an airplane. The Army put it's single plane under the Signal Corps and the airplane seemed started on the road to make its contribution to the defense of the United States.[28] The Secretary of War seemed more than ready to promote the aircraft's potential, asking for a $500,000 appropriation from Congress to develop military aviation "in a manner commensurate with its intrinsic importance."[29] Despite this backing, Congress again failed to provide the necessary funds.[30]

Seven years elapsed from the Wright's first military contract to the outbreak of World War One in 1914, with only modest gains in US aviation. The initial air force of the Signal Corps consisted of only thirteen men and one plane, and by 1913 had grown to only 22 aircraft and less than 100 men.[31] This slow growth was indicative of a military still skeptical of the airplane's utility. Arguably, the lack of funding from Congress is

understandable in light of "Langley's Folly" and the crash that killed Lieutenant Selfridge. Putting it in a modern light, what would be Congress' reaction if the first two Space Shuttles had crashed? I dare say that the program would either have been abolished or had its funding drastically reduced. Another factor that took money away from aviation was that Eliha Root, Secretary of the War Department, was still reforming the military in light of US performance in the Spanish-American War, giving first priority to field guns and ammunition, not aviation.[32]

By comparison, it is clear that by 1914 the other powers were more convinced than the United States that aviation would play a critical role in warfighting. The following shows aircraft, pilots, and money spent for aviation during 1914 and provides a measure of just how much significance individual countries placed on aviation:[33]

COUNTRY	PLANES	PILOTS/APPROPRIATIONS
FRANCE	260	171 $7,400,000
RUSSIA	100	28 $5,000,000
GERMANY	46	52 $5,000,000
ENGLAND	29	88 $3,000,000
ITALY	26	39 $2,100,000
JAPAN	14	8 $1,000,000
UNITED STATES	6	14 $125,000

Keep in mind that 1914 marked a high point in American military spending on aviation; from 1908 to 1913 the United States War Department only spent a total of $250,000 on aviation. Even countries like Mexico, Belgium, Bulgaria and Brazil spent more than the United States, whose gross domestic product was commensurate with Europe's great powers.[34]

Not only was the US outspent in military aviation, they also lagged behind in the organization needed to promote the technology. America put experimentation at the bottom of its list of military priorities, and prior to World War One the Army spent most of its research and development money on munitions and artillery.[35] In addition, organizations to advance aviation consisted of only a single branch of the Signal Corps.

In 1913, in hearings before the House Military Affairs Committee to determine the need for a separate Air Corps within the Army, Assistant Secretary of War Henry S. Breckinridge said that military aviation was merely a tool to aid the Army and that it neither warranted nor deserved consideration as an independent service. A similar lack of zeal for the airplane's potential was revealed through the military's belief in the supremacy of infantry; a prejudice which, coincidentally, also kept the tank from being fully exploited by the allies. United States Army *Field Service Regulations* in effect at the outbreak of World War One gave infantry the predominate role: "The infantry is the principal and most important arm, which is charged with the main work on the field of battle and decides the final issue of battle." In addition, the dirigible was still officially viewed by the US military as the primary air weapon.[36] In contrast, the Europeans were building multi-engine planes and developing task oriented aircraft, with France deploying seventy-two airplanes during an army maneuver in 1912.[37] On the organizational side, the British Royal Flying Corps was established in 1912, a Service unto itself, and boasted an Experimental Branch by 1913. Their enthusiasm for aeronautics even extended to industry, with more than a dozen English manufacturers building over 100 planes a year.[38]

Although there were some bona fide reasons for delays and caution in American military aviation, the attitude of the Chief Signal Officer, Brigadier General James Allen,

was at best shortsighted, and at worst downright treasonable in its affect on military aviation. Although rumors of war in Europe stimulated the Signal Corps to expand the role of aviation, moving from a few dozen to over 300 men, the mindset of its leader continued to hamper its progress in the early years. [39] In a letter to the Board of Ordnance, Brigadier Allen wrote that the airplane may be of some use in observation but that the balloon was a superior weapon: "For the purpose of dropping explosives a high speed aeroplane is hardly suitable....In passing over the enemy's works a flying machine should travel at least 4,000 feet above the earth....Traveling at the rate of thirty miles an hour at this altitude, even after considerable practice it is not thought a projectile could be dropped nearer than a half mile from the target."[40]

This early sentiment was echoed when, in 1914 the Chief Signal Officer admitted to the House Military Affairs Committee that the airplane could be useful as a reconnaissance vehicle, but "as a fighting machine the airplane has not justified its existence." This testimony was repeated later in his annual report to the Secretary of War and revealed an ingrained lack of foresight not only among military leadership but in other branches of the government. Representative McKellar, speaking before the House Military Affairs Committee, justified Congress' lack of funding for aviation, remarking, "...(military aviation has) proved worthless to a very large extent...(we are) gainers by not having spent so much."[41] Furthermore, the meager appropriations provided to military aviation reveal that McKellar was not alone in his views.

In light of insufficient Congressional backing and grudging support from military leaders it is amazing that the Signal Corps was able to make the progress it did. Significant to the growth of American military aviation was the fact that many lower

ranking officers didn't share their leadership's lack of faith in the airplane.[42] This view was highlighted by Lieutenant Benjamin D. Foulois, later to become American Air Service Commander-in-Chief in France, in a student thesis at the Fort Leavenworth Army Service School in 1907, predicting, "large fleets in the air would operate well ahead of ground forces."[43]

American interest in the airplane reached a peak just after the Wright's demonstrations of 1908, but those few flights seemed enough to satisfy public curiosity and interest waned in the years that followed. By 1913 the public had lost interest, the government gave it little notice, and the American aircraft industry paled in comparison to that of Europe's. Fortunately, America did have some leaders with foresight and just a few days before the war in Europe a bill passed by Congress in 1913 became law and gave new life to military aviation. Its provisions established an Aviation Section within the Signal Corps, provided aviation incentive pay, and increased spending on military aviation.[44]

To get over the hurdles placed before them, the advocates of aviation in the Signal Corps realized that they would have to forcefully push the air weapon. In 1914, this push came in the form of formal objectives and criteria to make the aircraft a viable weapon. In order to gain this data the men at the US Army's North Island Aviation Center in San Diego decided to hold a competition to determine what type of weapon system would provide the ideal "standard machine." Because the Chief Signal Officer had earlier acknowledged the airplane's potential as an observation platform, and observation required little specialization, the engineers and pilots at North Island decided this "standard machine" would be designed for aerial observation. Minimum specifications for

the aircraft stated that it should be a two-seater, capable of lifting a load of 450 pounds at a speed of 70 mph. To maximize the results of their competition they devised a point system, giving additional points for aircraft that exceeded their specifications in the areas of speed, load, rate of climb, maneuverability, field of vision as determined by a military observer, and quality of construction.[45]

The competition brought in 12 different bids but the lack of a reliable engine convinced the Signal Corps that it needed to hold a separate engine competition. Although appropriations from Congress and the number of aircraft and airmen remained small in 1916, these competitions did succeed in stimulating American military aircraft development and provided a framework for close cooperation between the military and civilian contractors.[46]

Not unexpectedly, the main push behind the early growth of American military aviation came in 1916 as the Europeans showed the aircraft's importance on the battlefield. The National Defense Act, passed in June, strengthened aviation by authorizing increases in personnel, special flying pay, and by increasing the Aviation Section's budget by $500,000 over their annual $300,000 appropriation. Basing his actions on "conclusions reached from experience abroad," the Chief Signal Officer proposed a requirement for three different types of aircraft: a reconnaissance and artillery fire-control type, a bomber type, and a pursuit type. In addition, he also formed 12 composite squadrons with 12 aircraft each: 8 for observation, 2 for bombing, and 2 for pursuit.[47]

Even with this new found commitment to military aviation the United States still met several barriers in developing an aerial weapon. As of late 1916, first hand experience in

air combat was limited to the use of eight Curtiss R-2 aircraft in a punitive raid on Mexico in which all the available equipment was destroyed in about six weeks.[48] Not only was US experience limited, they were was virtually cutoff from aviation information from Europe because even our "friends" deemed the technology too sensitive to disseminate. We were further limited by the fact that only a handful of American airmen were allowed to go to Europe to observe the fighting, and the little information they did pass on was virtually worthless. "Probably no military secrets were more closely guarded in Europe than developments in aviation."[49] The only decent information we had prior to entering the war in April 1917 came from American manufacturers working on foreign contracts.[50]

Notes

[1]Collier, Basil, *A History of Air Power*, (New York, Macmillan Publishing Co., 1974), 31.

[2]Chandler, Charles D., *How Our Army Grew Wings*, (New York, The Ronald Press Company, 1943), 139.

[3]Ibid.

[4]Swanborough, F.G., *United States Military Aircraft since 1909*, (London, Putnam, 1963), 1.

[5]Collier, 32.

[6]Swanborough, 1.

[7]Collier, 32.

[8]Futrell, Robert, *Ideas, Concepts and Doctrine: Basic Thinking in the United States Air Force, vol. 1*, (Maxwell: Air University Press, 1989), 9.

[9]Holley, I.B., Jr., *The United States Air Force Special Studies, Ideas and Weapons,* (Washington, D.C., Office of Air Force History, 1983), 25.

[10]Report of the Secretary of War, (*Annual Reports of the War Department*, 1908), 43-45.

[11]Collier, 33.

[12]Hildreth, C.H., *1001 Questions Answered About Aviation History*, (New York: Dodd, Mead & Company, 1969), 63.

[13]Ibid., 54.

[14]Collier, 33-34.

[15]Hildreth, 56.

Notes

[16]Ibid., 58.
[17]Ibid., 58-59.
[18]Sweetser, A., *The American Air Service*, (New York, D. Appleton, 1919), 8.
[19]Report of the Secretary of War, (1908), 45.
[20]Ibid.
[21]Collier, 34.
[22]Ibid., 35.
[23]Hildreth, 72.
[24]Sweetser, 9.
[25]Collier, 36.
[26]Hildreth, 55.
[27]Ibid., 59.
[28]Sweetser, 9.
[29]Report of the Secretary of War, (1908), 45.
[30]Holley, 27.
[31]Ibid.
[32]Ibid., 28.
[33]Sweetser, 16.
[34]Ibid.
[35]Report of the Secretary of War, (1903-1913), et al.
[36]Futrell, 8-9.
[37]Sweetser, 14.
[38]Holley, 30.
[39]Ibid.
[40]Futrell, 8.
[41]Holley, 31.
[42]Sweetser, 21.
[43]Futrell, 8.
[44]Sweetser, 20-21.
[45]Holley, 34.
[46]Ibid., 34-35.
[47]Ibid., 35.
[48]Swanborough, 1.
[49]Sweetser, xxvii.
[50]Holley, 36-37.

Chapter 4

Conclusions

Although the United States was the "first in flight," many factors prevented initial success from translating into aviation dominance prior to World War One. On the surface, military conservatism, congressional stinginess, and lack of foresight from all corners of government seem to be the overriding factors that prevented US military aviation from maturing. Of course, private industry's lack of enthusiasm for the airplane bolstered the government's position. In addition, early catastrophes, Dirigible competition, and other military attitudes and concerns obviously exacerbated reasons for early shortcomings in US military aviation. Regardless the reasons, under funding, lack of foresight and leadership, and the US gap in firsthand knowledge and experience left the Signal Corps Aviation Section woefully inadequate for its task when the US entered the war. They not only lacked hardware with which to engage in aerial combat, they lacked the basis from which to derive aerial warfare doctrine.

It can be argued that early problems and catastrophes in American aviation warranted slow progress. Nonetheless, instead of learning from failures and pushing on, like their European counterparts, the United States government and civilian sector threw in the towel too quickly and allowed precious time to elapse before committing to aviation. As Arthur Sweetser wrote in the preface of *The American Air Service,* 'American military

aviation initiated in a burst of enthusiasm and imagination but had to be driven along the road towards accomplishment, without the leadership that alone could have brought success.' Fortunately, other factors led Sweetser to conclude by saying, 'Although beset with unfavorable public opinion, the United States eventually earned a superb record in the war.'[1]

As Sweetser implied, leadership, or lack thereof, was a major hindrance to early US military aviation; the one man in a position to best promote aviation, the Chief of the Signal Corps, failed to see the airplane's potential. Because of the barriers placed in front of them the United States had only 65 officers and 1,100 men in the Aviation Section when we entered the war. They had only 200 training aircraft, none suitable for combat, and no practical experience or knowledge from which to draw on.[2]

Fortunately, the airplane proved itself on the battlefield, and the United States eventually deployed 45 squadrons to the front during World War One.[3] Eventually, over 150,000 Americans were engaged in aviation with more than 1,000 flying on the front. In addition, the United States had a system of flight schools established at home and abroad, and our industrial might was producing aircraft and becoming the "Allies' supply center" by the end of the war.[4]

In light of these facts, the United States' biggest barrier to military aviation was the fact that it didn't feel threatened and, hence, didn't see the need to pursue military aviation like the Europeans; the War removed this obstacle. If the United States had not entered the war in Europe it may have taken an additional twenty years for them to take aviation seriously.

In drawing lessons from our early failures in aviation I can't help but think what would happen to the United States Air Force if it and Congress in the post-Cold War world, shared similar views to that of the Signal Corps and Congress prior to World War One; as happened then, other countries, including adversaries, would eventually overtake the US in military preparedness and the technology stemming from military research. In time, this state of affairs would leave a vacuum that could nurture the seed of another superpower whose intentions towards could prove detrimental to international stability. Sure, if another major war came the US would probably catch up quickly, but at what cost in lives lost and ruined futures? Fortunately, the United States learned from its early mistakes in isolationist policy and currently leads the world in military air and space exploitation and in the resultant day-to-day technologies that so many of us take for granted. In addition, prosperity has allowed the US to continue to reach for the stars. US industrial and scientific might won the Cold War, and continues to lead the world in the current technology and information revolution made possible through the byproducts of military and space technology.

Notes

[1]Sweetser, A., *The American Air Service*, (New York, D. Appleton, 1919), vii.

[2]Mauer, Mauer, ed. *The US Air Service in World War I, Vol. 1.* (Washington, D.C., Air Force Office of History, 1978), 51.

[3]Swanborough, F.G., *United States Military Aircraft since 1909*, (London, Putnam, 1963), 2.

[4]Sweetser, viii.

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